

Discussion Papers

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Berlin, October 2009

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IMPRESSUM

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<http://www.diw.de>

ISSN print edition 1433-0210
ISSN electronic edition 1619-4535

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The Influence of Conflict on the Demand for Education in the Basque Region*

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September 2009

Abstract

It has previously been shown that civil conflict influences many economic factors, including education, which play an important role in development and economic growth. Previous authors working on the influence of conflict on education have, however, always focused strongly on the supply-side effects, whereas this paper examines the influence of conflict on the demand for education. It is theoretically shown that, under relatively general conditions, individuals living in a conflict area have an incentive to increase their level of education and that this effect depends on the individual's skill level. This hypothesis is then tested using the conflict in the Basque Region as a case study, which is an example of a conflict in which one would not expect strong supply-side effects. Using the other Spanish regions, an artificial region is created in which the population has a similar educational distribution as in the Basque Region. When comparing the true and artificial regions, it can clearly be seen that for individuals with a medium level of education, there is a strong incentive to increase their education level, which is in concordance with the theoretical model.

Keywords: Conflict; Education; Matching; Spain

JEL code: I21, D74, C15

*We are grateful to Guido Tabellini, Eliana La Ferrara, Martina Bjorkman and the participants of the Graduate Students Seminar (May, 2008) at Bocconi University and the *Solutions for a complex world - Governance, Conflict and Crisis, and Aid Effectiveness* Conference (November, 2008) in Maastricht, the Netherlands for their helpful comments.

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1 Introduction

The adverse effects of civil conflict on many factors that influence social well-being can be considered to be a well-established fact. For example, conflict researchers have previously examined the impact of conflict on health (Ghobarah *et al.*, 2004), human capital (Hoeffler and Reynal-Querol, 2003), physical capital (Abadie and Gardeazabal, 2003), economic growth (Murdoch and Sandler, 2002), and education (Lai and Thyne, 2007 and Ichino and Winter-Ember, 2004). Furthermore, the causes of civil war (Djankov and Reynal-Querol, 2007), particularly the impact of ethnicity (Fearon and Laitin, 2003) on conflict and its spillover effects (Murdoch and Sandler, 2002 and De Groot, 2009) are also topics discussed extensively in this literature.

On the other hand, it is well known that education plays an important role in economic growth (Barro, 2001 and Wong and Yip, 1999), equality (Gradstein, 2003), and the role of females in society (Schultz, 1995b). Moreover, returns to education (Garcia Prieto *et al.*, 2005 and Psacharopoulos and Patrinos, 2004) is regarded as an important topic as well as the basic consideration when making human capital investment decisions. Furthermore, education has an additional downstream effect: higher educated parents tend to have higher incentives to invest more on their children's human capital (Göksel, 2007).

Extending from the aforementioned literature, this paper aims to analyse the impact of conflict on the demand for education. Observing this impact will help to clarify the implications of conflict on this particular element of social well-being. It is important to stress that, unlike previous papers (Lai and Thyne, 2007, particularly), we aim to analyse the demand-side of education, instead of the combination of demand and supply-side effects. We have chosen the Basque conflict as a case study because this conflict has not had strong supply-side effects on education, which gives us the opportunity to look at the isolated influence of conflict in the demand for education.

In the following section of the paper, we provide a brief literature review. We introduce our theoretical model in the third section. In the fourth section, the empirical analysis and data are presented. The fifth section includes the results and the final section concludes.

2 Literature Review

To our knowledge, the only other paper that investigates the impact of conflict on education is by Lai and Thyne (2007), in which they use cross-sectional and time series methods to analyse the issue. The authors consider two mechanisms: the first channel entails the fact that civil wars are likely to destroy a state's system of education through the loss of infrastructure and personnel. The second channel is the reallocation of resources from education to military expenses. Lai and Thyne

use UNESCO education data for all states from 1980 until 1997 and examine the percentage change in educational expenditures for all education levels. They find evidence for their first claim, as both expenditures and enrolment decline during periods of civil war, but they do not find any proof for the reallocation of education funds towards military spending during conflicts. Finally, the supposed decrease in education expenses is only valid for higher level conflicts.

In their paper, Hoeffler and Reynal-Querol (2003) investigate the costs of conflict. They separate the costs into two subgroups consisting of economic and human costs. They also consider the long-term effects of civil war, taking into account the mortality rates among children, HIV in the military and the psychological damage of conflict. Surprisingly enough, they do not consider the impact of civil wars on education while performing these analyses.

According to Arrazola and De Hevia (2006), who use the Spanish Civil War as an Instrumental Variable to research the rates of return to education for men and women, there are three main reasons why educational attainment decreases during war periods. This includes difficulties in the physical access to schools, the decline in financial means for school attendance and need for children to leave school to earn money for their family. In this paper, we are interested in the impact of the Basque conflict, which is not an actively armed conflict and thus does not cause physical bans or damage to the schooling system. Our claim is that it still may influence the incentives to acquire education, due to changes in the returns to schooling. Basically, our main interest is the demand side of the schooling system instead of the supply side.

2.1 Brain Gain versus Brain Drain

Our hypothesis is related to the ongoing debate of brain gain versus brain drain in migration literature. It has been claimed that migration decreases economic growth and the average education level of the source country due to the departure of the more highly educated and more intelligent people (Bhagwati and Hamada, 1974 and Haque and Kim, 1995). Building on that, Wong and Yip (1999) claim that brain drain reduces the economic growth rate and has a detrimental effect on non-emigrants in the source country through income-distributional effects and the reduced human capital accumulation. Wong and Yip show that if the initial rate of human capital accumulation is relatively low, a representative non-emigrant's sum of discounted income and life time utility could deteriorate. But recently researchers have started to show that migration may in fact have positive effects for the source country (e.g. Mountford, 1997 and Stark, 2004). Borjas (1994) in his paper investigates the economics of immigration in detail and evaluates both positive and negative consequences of migration. Using cross section evidence, Boucher *et al.* (2007) claim that the access of households to high-skill internal migration networks increases the likelihood that children will attend school beyond compulsory level. Furthermore, they provide evidence that

if the returns to education are higher in the destination country, the incentive to invest in human capital will increase in the source country with a positive probability of migration. Likewise, Stark *et al.* (1997) claim that optimising workers in the source country will invest more in education if they have an opportunity to migrate and hence have higher expected returns to investment in human capital. Moreover, they find that costs of acquiring human capital are lower for more able workers than for less able ones. Both of these papers stress that only a proportion of the educated residents finally migrates and that therefore, in the end, the average level of education for the remaining population also increases. On the other hand, Beine *et al.* (2001) consider both beneficial and detrimental effects of migration. Their supposed “brain effect” refers to the improved incentives for investment in education as a result of improved migration opportunities, similar to the previously mentioned authors. The second impact of migration, referred to as the “drain effect” is the departure of some, if not all, educated agents. Beine *et al.* go on to claim that the sign of the total impact of the migration depends on which effect dominates.

As mentioned before, the aim of this paper is to analyse the impact of conflict on the demand for education. Civil conflict can have two different effects on education. It may either increase the incentives for education in order to be able to migrate out of the conflict region or reduce the incentives on human capital accumulation due to the problems caused by conflict and demoralisation.

2.2 Methodological Literature

The methodology used in this paper is inspired by Abadie and Gardeazabal (2003), who construct a synthetic control region, which resembles the Basque region, in order to be able to compare the economic evolution of that artificial region to the Basque region during the conflict era. The artificial region is constructed as a weighted combination of other Spanish regions chosen to resemble the characteristics of the Basque country before the conflict. The authors find a 10% average GDP gap and provide evidence that changes in the per capita GDP gap are associated with the intensity of the conflict.

In the same style, Guidolin and La Ferrara (2007) employ a similar methodology to conduct an event study regarding the sudden end of the conflict in Angola due to the death of the rebel movement leader in 2002. They aim to find how the value of diamond mining firms responds to conflict episodes and to estimate the relationship between abnormal return and political tension. In order to achieve this, two portfolios are constructed: a portfolio with firms that have significant Angolan interests, and a control portfolio that consists of companies that do not have such interests. The control group is formed by assigning weights to companies in order to minimise the Euclidean distance between two vectors containing the mean of abnormal returns, the variance of abnormal returns and the OLS beta of a world market portfolio model that regresses daily control returns on the world market for the period of four years before

the end of the conflict. Their results show that the end of the conflict decreases the abnormal returns of the Angolan portfolio rather than increase them. The authors interpret this as a signal that incumbent firms benefit from the existence of conflict due to the barriers to entry and reduction in a government's bargaining power caused by the instability created by the civil war. Their paper is an important contribution to the literature not only because of the methodology employed, but also because it proves that conflict may positively impact the interests of some agents.

2.3 Basque Conflict

Before continuing this paper, it is important to clarify the outline of the Basque conflict¹. The main actor of the Basque conflict is ETA (Basque for "Basque Homeland and Freedom"), whose main aim is to promote establishment of an independent Basque country. Although it was founded in 1959, ETA did not claim its first victim until 1968 (Abadie and Gardeazabal, 2003). Since then, ETA has killed 823 people and committed dozens of kidnappings. Abadie and Gardeazabal show a table listing the number of killings and kidnappings by ETA between 1968 and 2000, which is reproduced here in table 1. From table 1, it can be seen that the number of killings and kidnappings were low before 1973, but started to increase during the mid 1970s, peaking during the years of 1978-1980 (235 victims). After 1980, the number of killings decreased gradually. During the 1980s, on average, ETA killed 39 people per year and this number is reduced to 19 per year during the 1990s. In September 1998, ETA declared a cease-fire, which lasted for 14 months and in 2000 ETA killed 23 people (Abadie and Gardeazabal, 2003). ETA's main financial sources are kidnapping, extortion and some robberies. For these activities, they have been targeting mainly the Basque entrepreneurs. Another interesting thing is the fact that although ETA conducts its activities in almost all Spanish regions, most of its activities are concentrated in the Basque Region. According to the calculations of Abadie and Gardeazabal, almost seventy percent of deaths cause by ETA in Spain during 1968-1997 took place in the Basque Region.

3 Theoretical Model

For the current paper, we develop a naive theoretical model, which is merely used to outline our hypothesised changes in education as a result of a civil conflict. As mentioned earlier, the model is not generally applicable to simply any conflict, because, different from Lai and Thyne (2007), it focuses on the supply side of education, instead of the demand side. It is assumed that in the conflict region, as well as in the non-conflict region, education is sufficiently available and the level of education is

¹This subsection including the description of the Basque conflict leans heavily on the description provided by Abadie and Gardeazabal (2003).

Table 1: Number of deaths from ETA attacks

year	deaths	year	deaths	year	deaths
1968	2	1979	76	1990	25
1969	1	1980	92	1991	46
1970	0	1981	30	1992	26
1971	0	1982	37	1993	14
1972	1	1983	32	1994	13
1973	6	1984	32	1995	15
1974	19	1985	37	1996	5
1975	16	1986	41	1997	13
1976	17	1987	52	1998	6
1977	11	1988	19	1999	0
1978	67	1989	19	2000	23

Note: table is a replication from Abadie and Gardeazabal (2003).

determined primarily by the demands of the individual, instead of supply constraints. This assumption may not necessarily hold when considering longer time periods, as freely accessible (tertiary) education is something that has only developed during recent decades, but the assumption can be adjusted to read that there is no difference in the supply of education between the conflict area and the non-conflict area.

The outline of the model is as follows: An economy is populated by individuals who all have a particular level of ability. Using their level of ability, they decide to obtain a certain level of education and subsequently they decide whether to work in the home region, or whether to migrate and work in the migrant region. Individuals are fully rational and therefore make all their decisions through rational optimisation.

3.1 Model Outline

As mentioned above, the population consists of a continuum of individuals. These individuals differ in only two respects. First, they have an ability level $A_i \in [0; 1]$ and second, they are either susceptible to migration or not. In total, a proportion γ is potentially interested in moving, while the rest $(1 - \gamma)$ is not². The first group is the group that we are interested in and whom our model concerns, whereas the latter is simply staying in the home region and not involved in any migration decision. The Ability level A_i is the main determinant in the cost of acquiring education, where it obviously has a negative sign. The relationships between the Cost of Education

²This assumption is merely in place to avoid an outcome in which the entire population decides to migrate, which is unrealistic and undesirable.

(CE_i) and both A_i and the chosen Education level $E_i \in [0; 1]$ are convex, which yields the following type of cost function:

$$CE_i(E_i, A_i) = E_i^2 \cdot (2 - A_i)^2 \quad (1)$$

There are also other potential cost functions, but as long as it satisfies the initial conditions, the actual form does not significantly influence the results. During the first stage of the model, individuals use this cost function to determine their optimal level of education, taking into account the expected payoffs from education at a later stage. That second stage is when the individuals take up jobs and start working either in the domestic market or the migrants' market. The wages in these markets are the same in principle and depend on the level of education of an individual and a factor $\omega > 0$:

$$w_d(E_i) = w_m(E_i) = (1 + E_i) \cdot \omega \quad (2)$$

However, living as a migrant has one additional benefit. Individuals who live as migrants receive a bonus of $\lambda \in [-\infty; \infty]$, which represents the benefit of living out of your own region. This benefit can come from different sources, such as the expansion of job opportunities or an increased appreciation for highly developed skills. Another possibility, however, is that there is a peace bonus to living in another region, if indeed there is a civil conflict taking place in the home region. This is one of the channels through which we expect to see results. The second relevant channel is the costs incurred during migrating. These Costs of Migration (CM_i) consist of the fact that one is away from the home region, which may lead to problems of adjusting to a different culture and/or language. Particularly the language aspect is expected to be important and therefore, the Costs of Migration are decreasing in Education. One way this function could look is as follows:

$$CM_i(E_i) = (1 - E_i) \cdot \mu \quad (3)$$

where $\mu \geq 0$ is related to the difficulty of the adjustment process between the two different cultures.

The individuals have all this information available and decide whether to migrate or not. For this decision, they weigh the different levels of utility they would derive from migration and non-migration:

$$\begin{aligned} U_i &= (1 + E_d) \cdot \omega - E_d^2 \cdot (2 - A_i)^2 \text{ if } migr = 0 \\ U_i &= (1 + E_m) \cdot \omega - E_m^2 \cdot (2 - A_i)^2 + \lambda - (1 - E_m) \cdot \mu \text{ if } migr = 1 \end{aligned} \quad (4)$$

3.2 Solution

It is easy to see that this model is simply a game with three stages:

1. Decide on education level E_i , given A_i .
2. Decide whether to migrate or not.
3. Work and earn.

We therefore solve the game through backward induction. At the third stage, no real decisions are taken and this stage is therefore ignored. At the second stage, however, there is an important decision to be made. The outcome of this decision depends on the Utility levels that can be derived from migration and from staying in the domestic region. To be more precise, defining \widehat{E}_d and \widehat{E}_m as the optimal levels of education under the assumption that the individuals are either working domestically or as migrants, an individual decides to migrate when the following is true

$$\left[\left(1 + \widehat{E}_m\right) \cdot \omega - \widehat{E}_m^2 \cdot (2 - A_i)^2 + \lambda - (1 - \widehat{E}_m) \cdot \mu \right] - \left[\left(1 + \widehat{E}_d\right) \cdot \omega - \widehat{E}_d^2 \cdot (2 - A_i)^2 \right] > 0 \quad (5)$$

$$\lambda - \widehat{E}_d \cdot \omega + \widehat{E}_m \cdot (\mu + \omega) - \mu > \left(\widehat{E}_m^2 - \widehat{E}_d^2 \right) \cdot (2 - A_i)^2 \quad (6)$$

$$\sqrt{\frac{\lambda - \widehat{E}_d \cdot \omega + \widehat{E}_m \cdot (\mu + \omega) - \mu}{\left(\widehat{E}_m^2 - \widehat{E}_d^2 \right)}} > (2 - A_i) \quad (7)$$

$$\overline{A}_i = A_i > 2 - \sqrt{\frac{\lambda - \widehat{E}_d \cdot \omega + \widehat{E}_m \cdot (\mu + \omega) - \mu}{\left(\widehat{E}_m^2 - \widehat{E}_d^2 \right)}} \quad (8)$$

From equation 8, it can be seen that the decision to migrate depends on the equilibrium levels of Education, the individual Ability level and several parameters. An individual prefers to migrate when her threshold ability level (\overline{A}_i) is larger than the right-hand side of the equation. Taking this into account, we move back to the first stage of the game in which individuals decide on their education levels. We calculate separately what the equilibrium level of education is when migrating and when staying in the home region:

$$\max_{E_i} U_i = (1 + E_d) \cdot \omega - E_d^2 \cdot (2 - A_i)^2 \text{ if } migr = 0 \quad (9)$$

$$\max_{E_i} U_i = (1 + E_m) \cdot \omega - E_m^2 \cdot (2 - A_i)^2 + \lambda - (1 - E_m) \cdot \mu \text{ if } migr = 1 \quad (10)$$

Simply taking the First Order Conditions for each of these two expressions yields the following:

$$\begin{aligned}
\frac{\partial U_{i,d}}{\partial E_d} &= \omega - 2 \cdot E_i \cdot (2 - A_i)^2 = 0 \\
E_d &= \frac{\omega}{2 \cdot (2 - A_i)^2} \text{ if } migr = 0
\end{aligned} \tag{11}$$

$$\begin{aligned}
\frac{\partial U_{i,m}}{\partial E_m} &= \omega - 2 \cdot E_i \cdot (2 - A_i)^2 + \mu = 0 \\
E_m &= \frac{\omega + \mu}{2 \cdot (2 - A_i)^2} \text{ if } migr = 1
\end{aligned} \tag{12}$$

These equilibrium levels of education depend on the parameters of the model, and the individual level of Ability, A_i . It is important to note here that for a given level of Ability, an individual who decides to migrate will acquire a higher level of education than an individual who decides to stay at home, as long as $\mu > 0$. At this stage, we can insert expressions 11 and 12 into equation 8, to find the equilibrium after which individuals will find it more attractive to migrate and find work in the migration region:

$$\begin{aligned}
\overline{A_i} > A_i &= 2 - \sqrt{\frac{\lambda - \widehat{E_d} \cdot \omega + \widehat{E_m} \cdot (\mu + \omega) - \mu}{(\widehat{E_m}^2 - \widehat{E_d}^2)}} = 2 - \sqrt{\frac{\lambda - \frac{\omega^2}{2 \cdot (2 - A_i)^2} + \frac{(\omega + \mu)^2}{2 \cdot (2 - A_i)^2} - \mu}{\left(\left(\frac{\omega + \mu}{2 \cdot (2 - A_i)^2}\right)^2 - \left(\frac{\omega}{2 \cdot (2 - A_i)^2}\right)^2\right)}} \\
\lambda - \frac{\omega^2}{2 \cdot (2 - A_i)^2} + \frac{(\omega + \mu)^2}{2 \cdot (2 - A_i)^2} - \mu &> (2 - A_i)^2 \cdot \left(\left(\frac{\omega + \mu}{2 \cdot (2 - A_i)^2}\right)^2 - \left(\frac{\omega}{2 \cdot (2 - A_i)^2}\right)^2\right) \\
\lambda - \mu + \frac{1}{2} \cdot \frac{(\omega + \mu)^2 - \omega^2}{(2 - A_i)^2} &> \frac{1}{4} \cdot \frac{(\omega + \mu)^2 - (\omega)^2}{(2 - A_i)^2} \\
\overline{A_i} > A_i &= \left(2 - \frac{1}{2} \cdot \sqrt{\frac{(\omega)^2 - (\omega + \mu)^2}{\lambda - \mu}}\right)
\end{aligned} \tag{13}$$

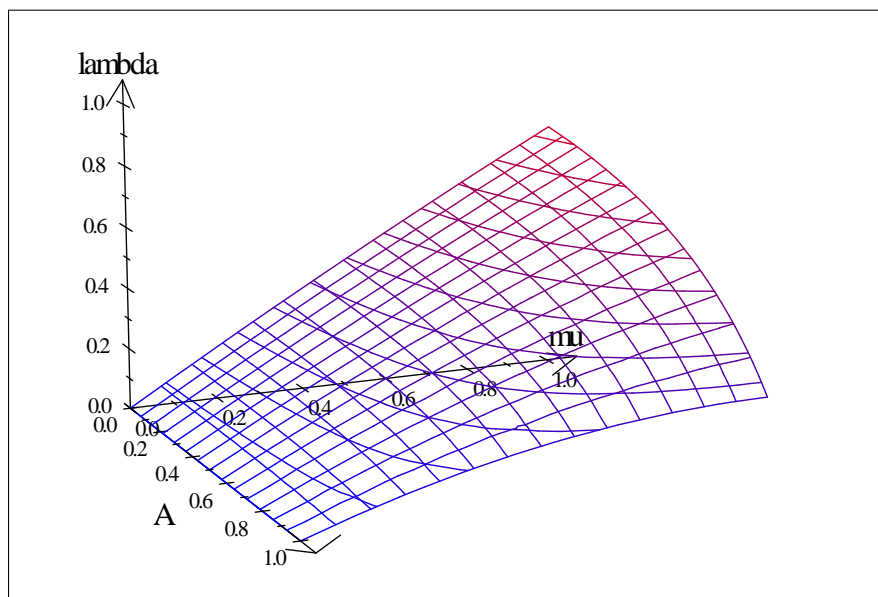
So, apart from a number of coefficients, the decision whether or not to migrate depends solely on the level of Ability.

3.3 Interpretation

Unfortunately, the interpretation of equation 13 is not very straightforward at first sight. There is, however, a way of graphically showing the implications from this equation. If we assume unity wage, so $\omega = 1$, equation 13 becomes:

$$\overline{A}_i > A_i = \left(2 - \frac{1}{2} \cdot \sqrt{\frac{1 - (1 + \mu)^2}{\lambda - \mu}} \right) \quad (14)$$

There are now only two coefficients left (λ and μ), in addition to the level of Ability A_i . The way this can be represented is by looking at the combinations λ and μ that will give a particular threshold level of Ability above which it is more attractive to migrate. In figure 3.3, the threshold for choosing to migrate is shown as function the relevant characteristics. As can be seen, given λ , an increased level of μ will require a higher Ability level in order to migrate. Conversely, keeping μ constant, a higher λ indicates that the cut-off level of Ability is lower.



The combinations of λ , μ and A_i where individuals decide to migrate or not.

It is important to stop for a moment and consider the interpretation of figure 3.3. Looking at an example, we know that with $\lambda = 0.4$ and $\mu = 0.4$, even individuals who have $A_i = 0$ are interested in migrating and working in the foreign region. On the other hand, when $\lambda = 0.2$ and $\mu = 0.5$, not even the top of the Ability distribution is going to be willing to migrate and work abroad. Of course, it would be expected that the real values of λ and μ are somewhere in the middle of these extreme examples.

The implications of figure 3.3 should be obvious in the context of the current paper. An outbreak of a relatively small-scale civil conflict in the domestic region is

going to increase λ , which leads to an increase in migration, as long as the ex ante equilibrium is somewhere in the medium region. However, an autonomous shift of λ will not merely change the size of migration, but also the composition. After all, when e.g. $\lambda \approx 0.36$ and $\mu = 0.5$, any individual who is potentially interested in migrating³ needs $A_i \geq 0.5$ in order for him to have an incentive to migrate. This implies that the level of education of migrants is distributed between 0.5 and 1. Now, if due to the occurrence of a civil conflict, λ increases and becomes $\lambda_{new} \approx 0.40$, the threshold level of Ability will go down to 0.3. This leads to an increase in migration, but also to a reduction of the Ability level, which will now be distributed between 0.3 and 1.

The implication for education can be seen as follows: Of those individuals born in the domestic region, the increase in potential migrants will in fact increase the over-all level of education. The average level of education for migrants, on the other hand, is going to fall, due to the increased presence of low-Ability individuals in the total pool of migrants.

3.4 The Basque case

The case of the Basque civil conflict fits into the current model very well, particularly because Spain and the Basque region are politically unified. This reduces the Cost of Migration and increases the percentage of people who would potentially be interested in migrating. In this particular case, it is only the cultural and linguistic differences that make the move more difficult. Another major difference with the standard migration literature (e.g. Borjas, 1994), is the fact that there are no legal differences between the education systems of the Basque and Spanish regions, so the problem that highly educated migrants end up doing lower class jobs does not take place here.

During the conflict, there have been no significant effects on the supply of education and any changes in education achievement are due to demand changes. In the next section, we analyse empirically what the presence of the Basque conflict did to the education achievements of Basque-born individuals. For this, we could look at the average educational achievement, but according to the theoretical model described here, the effects should be stronger in one particular part of the educational distribution. In fact, assuming that the combinations of λ and μ do not take on extreme values that would lead to no or full migration, it can be expected that the shift as a result of the conflict takes place in the middle part of the educational distribution. This leads to an increased overall level of education and to a lower level of education for the population of domestic migrants from the Basque Region.

³Remember that we said that only a portion γ of the population is potentially interested. This is to make sure that there is no situation in which the entire population chooses to migrate.

4 Empirical Analysis

In the previous section, we described a hypothesis on how the presence of civil conflict may influence education outcomes, even when, contrary to Lai and Thyne (2007), a conflict does not influence the supply of education. To empirically test whether this hypothesis is true, we employ a method based on Abadie and Gardeazabal (2003) and in this section we explain how. In a nutshell, the idea is that we use a dataset on realised education for people born in different Spanish provinces and in different years, which is then used in an ordered probit analysis to take out the most obvious explanatory factors for education accomplishments. This first stage yields a dataset on "residual education" for individuals from all different Spanish regions. At the second stage, the dataset is split into one pre-conflict dataset and one dataset that takes place during the conflict. Using the pre-conflict dataset, we then apply a matching method to create an artificial region that exhibits the same characteristics as the Basque region, pre-conflict. After doing this, we compare the distributions of education in the true and artificial Basque Regions during the conflict, from which it is possible to conclude what the effect of the conflict on education is.

In the following subsections, the details of the analysis are explained more precisely.

4.1 First Stage Regression

Different from the Abadie and Gardeazabal (2003) analysis, we choose to filter out the alternative explanatory factors of education level before creating the artificial region during the second stage. The dataset we employ are the 1991 and 2001 Census results, which report, among many other things, the realised education level of all interviewed individuals. Of course, in order to make sure that individuals will have completed their entire education, only those individuals who have reached the age of 25 at the time of the Census are included.

The education levels are given in levels between 1 and 10, representing everything from *illiterate* until *PhD – level*. As these are categorical non-continuous observations, the use of Ordinary Least Squares is ruled out. Instead, we perform an ordered probit analysis, with education level as the dependent variable. The independent variables are the most ex ante obvious variables to explain the level of education. In an ideal situation, this would include variables like the wealth status of the individual's family at the time of birth or the parental level of education, but unfortunately these data are impossible to obtain. The only totally exogenous explanatory variables that are available at the individual level are year of birth and gender. So while it is not possible to add further individual-specific control variables, there are several variables at the provincial level that add a significant amount of explanatory power. First of all, there is Provincial GDP level. As this may be endogenous to the level

of education of the population, it is important to have an ex ante level of GDP. Unfortunately, due to the specifics of the Spanish situation, there is very little available in terms of old provincial data and we therefore use the oldest trustworthy source of data that can be found: GDP in 1967. Most importantly, this year is before the actual start of the conflict and can therefore be considered as a relevant explanatory variable.

The other provincial-level variables are related to the supply of education. After all, obtaining a higher level of education is largely dependent on the availability of educational institutions. As a proxy for the availability of lower level of education, we use population density. After all, primary and secondary education are nearly universally available as long as there is a minimal mass of people. The only possible impediment to accessing these levels of education is the potential travel time to and from schools, which, again, is directly related to the population density in a province. In order to make sure there are no endogeneity issues, we use the population density at the provincial level at the nearest decade (1930, 1940, etc) before birth. For tertiary education, we have used a more sophisticated method and set up a database on the Spanish Higher Education. In subsection 4.3, there is further explanation concerning the data collection, but it suffices to say that we use a dummy variable that says whether or not an institution of higher education is available in the province, 18 years after birth. Finally, in order to pick up any other province-specific effects, we add province-dummies for each of the 50 provinces in our dataset⁴.

Empirically, the Ordered Probit regression we estimate during the first stage looks as follows:

$$\Pr(edu_{i,y,p} = lvl) = \left[\begin{array}{c} \beta_1 \\ \vdots \\ \beta_{50} \end{array} \right] \left[\begin{array}{ccc} D_1 & \cdots & D_{50} \end{array} \right] + \beta_{51} \cdot sex_i + \beta_{52} \cdot birth_i + (15) \\ \beta_{53} \cdot \ln(gdp_{1967,p}) + \beta_{54} \cdot dens_{p,|y|} + \beta_{55} \cdot uni_{p,y+18} + \varepsilon_{i,y,p}$$

where $edu_{i,y,p}$ is the level of education of individual i , born in year y in province p . lvl represents the possible level outcomes for education⁵. $D_1 \cdots D_{50}$ are the provincial dummies, sex_i is a dummy variable taking value 1 when an individual is male, $birth_i$ is the year of birth of the individual, $gdp_{1967,p}$ is the 1967 GDP level in the province of birth, $dens_{p,|y|}$ is the population density in the nearest full decade before birth and finally, $uni_{y+18,p}$ is a dummy variable that takes value 1 when a university is present in the birth province when the individual reaches age 18.

⁴As explained at a later stage, the provinces of Ceuta and Melilla are dropped due to their specific status.

⁵This is an ordinal variable, which is why we use the Ordered Probit methodology. The situation would be different if the education level were, for example, measured in total years of schooling. The total number of levels is ten.

After running the regression in equation 15, we have probabilities for each educational outcome for every single individual. Using a simple measure, we then calculate the so-called residual education, res_i which is taken to the second stage of the analysis:

$$res_i = edu_i - \frac{\sum_{\eta=1}^{10} \Pr(\eta_i)}{10} \quad (16)$$

where η_i are the different levels of education that are obtainable.

4.2 Second Stage

The inspiration for the second stage comes from the paper by Abadie and Gardeazabel (2003), who analyse the influence of the Basque conflict on economic growth. However, there are a number of significant differences between their methodology and ours. Abadie and Gardeazabel construct an artificial region, with all the non-Basque regions as potential elements. While we do the same in principle, an important distinction is the fact that we attempt to replicate the entire distribution of educational achievement, and not simply the average. For that reason, we split up all our data in ten different deciles, and perform the matching analysis upon each separate one. The next important difference is that Abadie and Gardeazabel replicate the explanatory factors of economic growth (such as the physical and human capital stocks) and then look at the resulting levels of GDP. As we have taken out the (few) obvious explanatory variables in the first stage of the analysis, it is feasible for us to simply create a matching of the outcome (level of education).

First, with D_J as the total number of deciles from all J potentially contributing regions to the artificial region ($D_J = 10 \cdot J$), we define $\mathbf{W} = (w_1, \dots, w_J)$ as a $(D_J \times 1)$ vector of weights for each decile of each contributing region j . $\mathcal{W} = \{(w_1, \dots, w_J)'\}$ is the set of possible different combinations of w_j , under the conditions that $w_1 + \dots + w_J = 1$ and $w_j \geq 0 \forall j = 1, \dots, J$. \mathbf{Z}_1 is a $T \times 1$ vector containing the educational outcomes for the decile under analysis, where T is the number of pre-conflict time periods used. \mathbf{Z}_0 is a $T \times D_J$ matrix which contains the same outcomes for all J regions during all T time periods. We then use the following method to find the outcome of \mathbf{W} that minimizes the difference between the real Basque region and the artificial one:

$$\mathbf{W}^* = \arg \min_{\mathbf{W} \in \mathcal{W}} (\mathbf{Z}_1 - \mathbf{Z}_0 \mathbf{W})' (\mathbf{Z}_1 - \mathbf{Z}_0 \mathbf{W}) \quad (17)$$

This method is repeated ten times for each decile in order to get estimations for each one. As a basis, we utilise the data from people born between 1930 and 1955 as the source of data for the pre-conflict births. As the conflict breaks out around 1970, this means that all individuals who reach age 15 after the initiation of the conflict are

assumed to be influenced by its presence. As this choice may seem rather arbitrary, we show in the robustness checks that the results do not change significantly for other reasonable pre- and post-war assumptions. The post-war generation, as discussed in the next section, finishes with the generation born in 1976, after which there is no data available on completed educations.

4.3 Data

In this section, we give a description of our data sources and a description of what is done to make them suitable for this analysis. The dependent variable is the accomplished education level, which runs, as said before, from 1 until 10. Like all the individual data, these data come from the National Censuses in 1991 and 2001 (Instituto Nacional de Estadística, 1991, 2001). Unfortunately, the two Censuses use different definitions of the Education system, but using information from the Ministry of Education (retrieved from <http://www.mec.es>), we can transform the fifteen categories in the 1991 Census to conform to the ten categories in the 2001 Census⁶. The 1991 Census used a 10% sample of the population, yielding a total of 3,888,692 observations and the 2001 Census interviewed 2,039,274 individuals, giving us a total of 5,927,966 observations. However, we drop those individuals who are born abroad or in either Ceuta or Melilla, the two small city-regions on the North-African coast and retain 5,714,097 individuals. The next step is dropping the individuals who may not yet have completed their entire education. Assuming that the maximum level of education is in principle reached at the age of 25, we drop all observations aged less than 25 at the time of their Census interview, thus retaining 3,842,997 observations. As can be seen in the results section, we experiment with the starting date for the analysis and drop more observations that way, but in principle we can use nearly 4 million observations.

From the Census, we also retrieve the gender, the birth year and the birth province upon which the provincial dummies are based. Next up is the provincial density, which proxies the availability of primary and secondary education. These data are also retrieved from the Instituto Nacional de Estadística’s Census results (2008). Goerlich Gisbert and Mas Ivars (2001) are the source for the 1967 GDP data.

The final variable in the first-stage ordered probit regression is the dummy for whether or not there is an institution of Higher Learning in the Province of birth. To create this variable, we obtained a list of current institutions of Higher Learning

⁶More particularly, the categories “Formacion Profesional 2º grado, Maestria Industria” and “Otras titulaciones media” were combined to become “FP Grado Superio”. “Arquitecto e Ingeniero Técnico y Diplomado (aprobado compieto 3er curso) de Escuelas Técnicas Superiores”, “Diplomado de Escuelas Universitarias y Diplomado (aprobado completo 3er curso) de Facultades y Colegios Universitarios”, “Arquitecto o Ingeniero Superior” and “Titulaciones de Estudios Superiores no universitarios” form “Diplomatura” and finally, “Titulaciones de Estudios de Posgrado o Especializacion para Licenciados” is added to the category of “Doctorado”.

from the Ministry of Education. We then performed a web-based research on all the individual institutions and set up a database on their respective histories. This database includes the founding dates of each of the institutions, and whether they are follow-ups of other institutions. If they are, we then looked up the founding dates of the previous institutions. For most institutions, this method worked very well and for those few for which it did not, we contacted the institutions directly to obtain the required data. Overall, this yielded a database with an observation for each province-year and whether or not an institution of higher learning was present.

5 Results

As explained in the previous section, we start with a first-stage regression that aims to take out the most obvious effects that influence the level of education. The results of this regression, following equation 15, are shown in table 2. The different columns all use different sample periods, which is going to be useful at the next stage when it has to be determined which time period is most appropriate. It can already be seen that the differences in the coefficients between different periods is relatively small, so the sample selection is not expected to have a strong influence.

A disadvantage of using ordered probit analysis is the difficulty of interpreting the coefficients. Therefore, for ease of interpretation, an Ordinary Least Squares (OLS) regression is added in table 2, of which the coefficients do not necessarily convey much meaning, but the signs of the coefficients do. Unsurprisingly, sex has a positive effect (with men given the value 1 for this dummy variable) and the year of birth does as well. As expected, richer regions also have higher levels of education. The effect of population density, on the other hand, has an effect opposite to what might be expected. After all, it was hypothesised that an increase in density should be associated with easier access to schools and therefore an increase in education. It turns out that this effect is actually going in the opposite direction and an increase in population density is in fact associated with a lower level of education.

Following equation 16, we calculate the residuals of the level of education and end up with our variable referred to as “residual education”, with which we continue to go on to the second stage of our analysis. At this second stage, we use equation 17 to determine the values for the artificial region. The different components that make up the artificial Basque Region are shown in table 3. Our artificial region is composed of very different elements than Abadie and Gardeazabal’s, whose artificial region consists of only Catalunya and Madrid. For our results, on the other hand, all regions, except the Balearic Islands, contribute to the behaviour of the synthetic Basque region. For conciseness, we have summarised the data, and we show for the artificial low, medium and high levels of education what the contributing regions are. As for the contributing deciles, the table shows whether the contributing decile is equal to the contributed decile (*same*), whether it is from one of the lower deciles

Table 2: Results from the first-stage Ordered Probit regression

	all_data	>1909	>1929	>1934	OLS, >1909
<i>sex</i>	0.163*** 0.001	0.160*** 0.001	0.127*** 0.001	0.108*** 0.001	0.208*** 0.002
<i>birthyear</i>	0.040*** 0.000	0.041*** 0.000	0.047*** 0.000	0.047*** 0.000	0.054*** 0.000
$\ln(gdp_{1967})$	1.500*** 0.011	1.504*** 0.011	1.536*** 0.011	1.503*** 0.012	2.022*** 0.018
$\ln(popdens)$	-0.284*** 0.004	-0.317*** 0.005	-0.484*** 0.006	-0.483*** 0.006	-0.101*** 0.008
<i>unipres</i>	0.051*** 0.002	0.041*** 0.002	0.020*** 0.002	0.034*** 0.003	0.128*** 0.004
<i>prov_dummies</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
<i>N</i>	3834854	3736709	2958818	2640918	3736709
$LR - \chi^2$	1620372.7	1519346.1	922046.3	684278.3	-
<i>df</i>	53	53	53	53	$\overline{R^2} = 0.26$

*Note: The results of the first stage regression show the values of some of the most obvious explanatory variables that are able to explain long-run education achievements. The table shows coefficients and standard errors and *** implies a significance level of more than 99%.*

(*lower*) or whether it is from a higher decile (*higher*). The final column shows the contribution of all contributing elements to all deciles. For example, when creating the lowest three deciles, 54.2% of the contributions come from same-level deciles in other regions and particularly Madrid and Navarra play a large role. At the same time, 33.2% of the contributions to the lowest deciles come from higher-ranked deciles (Cantabria and Navarra, in particular), while 12.6% come from lower-ranked deciles⁷. Of course, this is only a summary measure and the more detailed information could be interesting too. The contributors can be quite surprising in fact. For example, for the recreation of the fifth decile, the contributors are as follows: Navarra decile 1 (13.7%), Cantabria dec.3 (1.9%), Galicia dec.3 (18.1%), Navarra dec.3 (10.2%), Canary Islands dec.4 (8.2%), Catalunya dec.5 (26.3%), Cantabria dec.6 (4.3%), Aragon dec.6 (9.6%), La Rioja dec.6 (5.9%) and Madrid dec.10 (1.9%). For all deciles together, the greatest contributors are Navarra with 28.9%, Madrid with 14.0% and Asturias with 9.4%

Of course, the question remains whether these results reflect reality well. This can be shown graphically, by showing the graphs that compare the true Basque region with the artificial one. Figures 1, 2 and 3 show the residual education values for the

⁷Of course, for the first decile, there are no lower-ranked deciles, so a specific value for the first deciles has to be 0. The contributions of Vastile & Leon, Madrid and Navarra take place in the estimation of the second and third deciles.

Table 3: Weights distribution within artificial Basque Region

		Deciles			
		<i>lowest 3</i>	<i>middle 4</i>	<i>highest 3</i>	<i>All</i>
	<i>Valencia</i>	0	0.092	0	0.037
	<i>Andalusia</i>	0	0	0.071	0.021
	<i>Asturias</i>	0	0.099	0.058	0.057
L	<i>Vastile&Leon</i>	0.049	0	0	0.015
O	<i>Cantabria</i>	0	0.005	0.014	0.006
W	<i>Galicia</i>	0	0.126	0	0.051
E	<i>La Rioja</i>	0	0.007	0	0.003
R	<i>Madrid</i>	0.054	0.033	0	0.030
	<i>Murcia</i>	0	0.064	0.022	0.032
	<i>Canary Islands</i>	0	0.021	0	0.008
	<i>Navarra</i>	0.022	0.093	0	0.044
	TOTAL	0.126	0.539	0.165	0.303
	<i>Catalunya</i>	0.018	0.139	0.008	0.063
S	<i>Cantabria</i>	0.009	0	0.075	0.025
A	<i>La Rioja</i>	0	0	0.007	0.002
M	<i>Madrid</i>	0.237	0	0.125	0.108
E	<i>Navarra</i>	0.278	0	0.199	0.143
	TOTAL	0.542	0.139	0.415	0.343
	<i>Catalunya</i>	0	0	0.013	0.004
	<i>Castille-La Mancha</i>	0	0.029	0	0.012
	<i>Asturias</i>	0	0.009	0.112	0.037
H	<i>Vastile&Leon</i>	0	0	0.135	0.040
I	<i>Extremadura</i>	0	0	0.033	0.010
G	<i>Cantabria</i>	0.055	0.014	0.067	0.042
H	<i>Galicia</i>	0	0.016	0	0.007
E	<i>Aragon</i>	0	0.049	0.060	0.038
R	<i>La Rioja</i>	0	0.130	0	0.052
	<i>Madrid</i>	0	0.005	0	0.002
	<i>Murcia</i>	0	0.021	0	0.009
	<i>Navarra</i>	0.277	0.048	0	0.102
	TOTAL	0.332	0.322	0.421	0.355

Note: The table contains the weights of "same", "lower-ranked" and "higher ranked" deciles for all relevant regions in the construction of the different artificial decile groups. The table is explained further in the accompanying text.

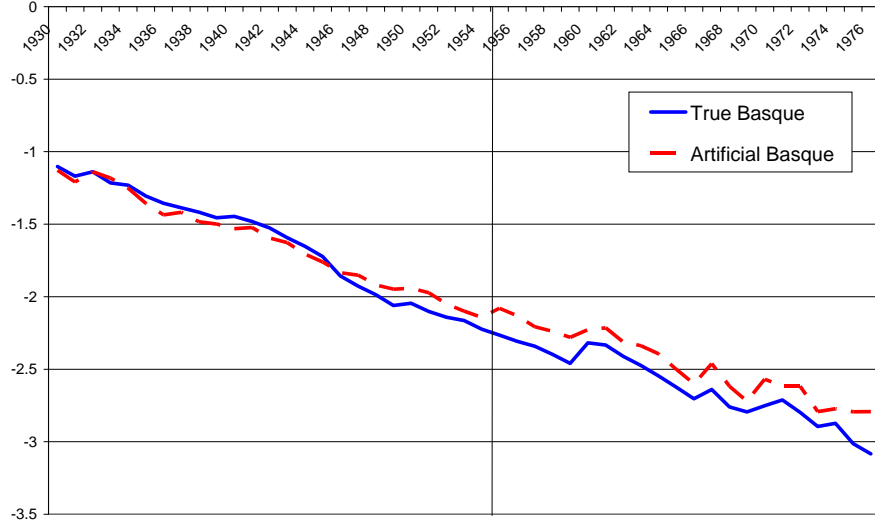


Figure 1: This figure contains the values of residual education for the true Basque and the articial Basque regions for the three lowest deciles.

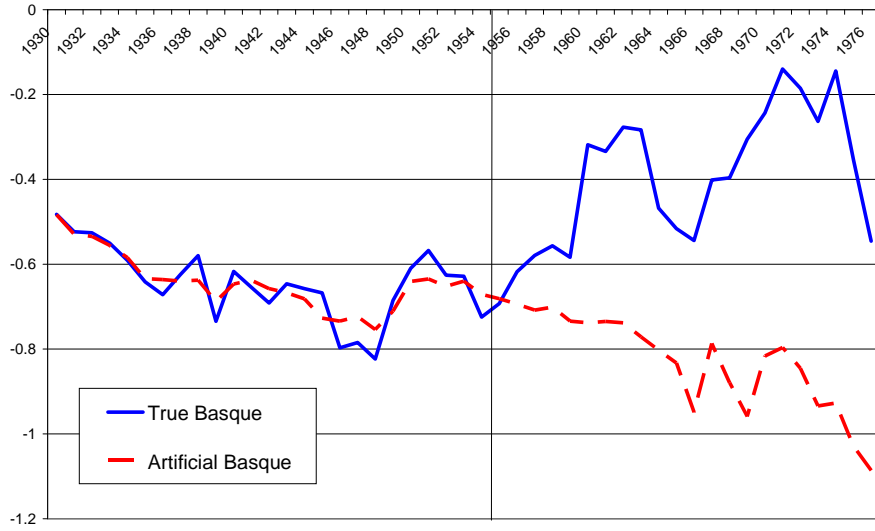


Figure 2: This figure contains the values of residual education for the true Basque and the articial Basque regions for the four middle deciles.

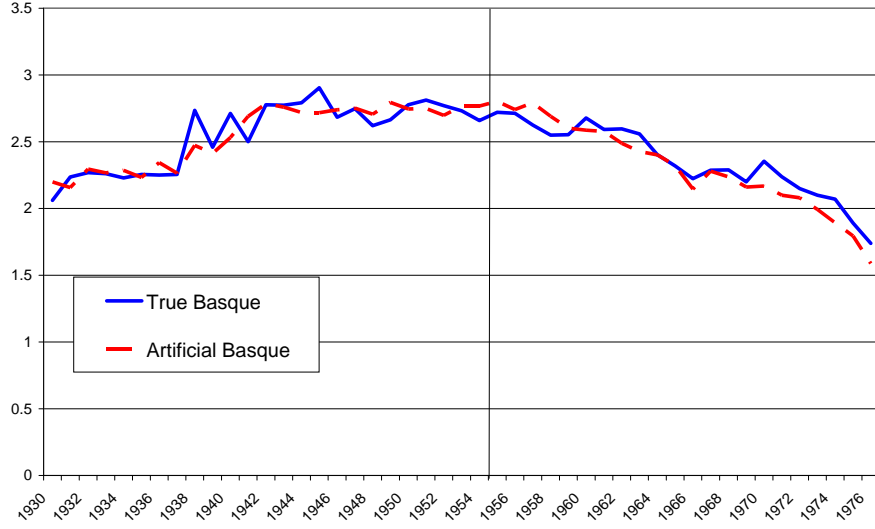


Figure 3: This figure contains the values of residual education for the true Basque and the artificial Basque regions for the three highest deciles.

low, middle and high deciles of the true and artificial Basque Regions. For the lowest deciles, it can clearly be seen from the graph that there is a disparity between the true Basque region and the artificial region, but it also shows that this divergence starts before the conflict-generation is born. In fact, for those born after 1955, the disparity is not any larger than for those born before 1955. For the highest deciles (figure 3), there is also no division at all between the pre-conflict generation and the post-conflict generation. However, when looking at the middle levels of education in figure 2, a clear divergence takes place. As we hypothesised in section 3, the level of education for this group of individuals actually increases compared to the artificial Basque Region. This is compatible with what we have stated earlier, if indeed a larger portion of these individuals decides to seek opportunities outside the Basque Region. A quantification is possible, with the total divergence between the true and artificial Basque Regions being approximately 0.5 points of residual education. In order to put this value in perspective, we have calculated the average difference between any two contiguous deciles, which turns out to be approximately 0.6. Therefore, the relative increase in education is nearly equal to an upward movement of one decile for the entire middle population, which is a surprisingly large result.

5.1 Additional evidence

Our results in the previous section indicate that in the Basque Region, the middle deciles increased their levels of education disproportionately compared to individuals

who did not reside in the conflict region. In section 3, we hypothesised that this is due to the increased incentives to migrate. Of course there may be other channels through which the changes in educational achievements change, but since we have no alternative theories available, it makes sense to test the migration theory. We do this by looking at the actual migration behaviour of individuals. Here we use a relatively straightforward technique and simply consider the diff-in-diff for within-country migration from the Basque Region and from all non-Basque regions. As is shown in the top part of table 4, both before and after the conflict, Basque-born individuals are less likely to migrate to other Spanish regions than individuals born elsewhere. This may be due to the cultural difference between the Basque Region and the other Regions, but it may also be due to the superior economic position held by the Basque Region. The same table, however, also shows that there is quite a large decrease in the probability of migration for non-Basque individuals after the cutoff point. The Basque-born individuals, on the other hand, actually become slightly more likely to migrate. This implies that, according to our difference-in-difference estimation, the Basque-born indeed increase their probability of within-country migration.

Another important implication from the theoretical model is a (relative) decrease in the level of education of migrants. After all, the education cutoff beyond which individuals decide to migrate moves to a lower part of the distribution and as a result, the average migrant's level of education should go down. Considering the difference-in-difference, the lowest section of table 4 shows that the level of education of migrants from the Basque Region indeed decreases, compared to migrants from other regions. However, in contrast, the middle section of the table shows that the overall education level of Basque-born individuals increases faster than that of non-Basque born, despite the fact that the Basque-born have a higher level of education to start with. Again, this is evidence that supports our theory that the occurrence of conflict increases the incentive to migrate and that the potentiality of migration requires a higher level of education.

Three things should, however, be considered in this case as well. The first is the geographical size of the regions. After all, their sizes differ immensely and it can be expected that fewer people from large regions migrate than people from geographically smaller ones. For two reasons, this cannot be driving the effect we find. First of all, the Basque Region is in fact among the smallest of the regions and one therefore should in principle expect a higher level of migration, which is not the case. Second, as the sizes of the regions do not change over time, this cannot be expected to influence the results from our difference-in-differences analysis.

The second thing that needs to be considered is foreign migration. As we use data from the Spanish Census, this merely includes data regarding those individuals who are still living in Spain. The percentage of Spaniards migrating internationally has been relatively small (compared to within-country migration) and would not be able to explain our results. However, even if there were a relatively large amount of international migration, this would have only two effects: First, it would increase

Table 4: Naive diff-in-diff estimation of effects of civil conflict on migration and education levels

	<i>Spain</i>	<i>Basque</i>	Difference	
%Migrants				N=3,995,162
<i>Pre-conflict</i>	<i>30.5</i>	<i>15.1</i>	-15.4	
<i>Post-conflict</i>	<i>25.2</i>	<i>15.4</i>	-9.8	
Difference	-5.3	0.3	5.6***	(0.227)
Educ_all				N=3,986,468
<i>Pre-conflict</i>	<i>3.09</i>	<i>3.85</i>	0.77	
<i>Post-conflict</i>	<i>4.79</i>	<i>5.69</i>	0.90	
Difference	1.70	1.83	0.13***	(0.0096)
Educ_migr				N=1,093,197
<i>Pre-conflict</i>	<i>3.33</i>	<i>4.42</i>	1.09	
<i>Post-conflict</i>	<i>4.82</i>	<i>5.76</i>	0.94	
Difference	1.49	1.34	-0.15***	(0.026)

Note: This table shows a naive difference-in-difference comparison between the Basque region and the rest of Spain, in which it can be seen that migration out of the Basque Region has increased, that the average education level has increased and that the average migrant's education level has decreased. Between brackets, the standard deviations of the diff-in-diff estimations are included.

the amount of migration, particularly from the Basque Region, as it is close to the international border with France. Second, with the increasing integration between Spain and the rest of Europe, including their joining of the European Union, one would particularly expect the later period to have increased total migration, because of the international component. This would imply that the result we find now is in fact an underestimation of migration effect rather than an overestimation.

Finally, the third thing that further strengthens our results is government policy. For political reasons, successive Spanish governments have been trying to give incentives to individuals to move towards the Basque region. This would imply that overall, within-country migration has been stimulated more in the non-Basque regions than in the Basque Region itself, which again biases our results in the direction of an underestimation, rather than an overestimation.

6 Conclusion

In this paper, we analyse the potential effect that conflict has on the incentives to acquire education. According to our naive theoretical model, the demand-side effects of civil conflict particularly influence the middle level of education, although this depends on the parameters of the model. We test our theoretical model in an analysis of the Basque conflict region in Spain. After all, this is exactly the kind of conflict in which our theoretical model is applicable, because it is a conflict that is relatively low-key and influences only the demand for education and not the supply thereof. After all, at no time during the conflict, was there any significant interruption of the supply of education, which makes it an interesting case to analyse. When using a relatively advanced matching technique to set up an artificial region that has an educational distribution similar to that of the Basque Region, it turns out that the effects are indeed particularly visible among the median levels of education. These individuals, it turns out, acquire a significantly higher level of education after the initiation of the conflict than beforehand, which leads us to believe that there exists in fact a causal relationship. The probability of migration of this group also increases over time, which is in concordance with our results.

The results found in this paper contrast previous findings in which conflict has been shown to have a negative impact on human capital accumulation. We argue that this negative relationship is indeed true, but fully due to supply-side effects, whereas demand-side effects actually increase human capital accumulation. As a result, the supply-side effect found in previous papers is probably an underestimation of the true effect.

While it is a little difficult to see usable policy recommendations on basis of our results, we do believe there is scope for some. One of the major differences between the conflict in the Basque Region and many other civil conflicts is its geopolitically limited scope. The conflict is limited to the Basque Region only, and the rest of the same political entity (i.e. Spain) is unaffected. Apart from potential cultural-

linguistic barriers, there are no barriers to migration between the Basque Region and the rest of Spain, which makes sure that, even when individuals expect only a modest utility improvement from migrating, they still increase their demand for education. In many other conflicts, momentarily ignoring the supply-side effects, civil conflict in one country may in fact increase the difficulty of migration to other places, when a conflict engulfs an entire nation. And this is where we can suggest one potential policy recommendation, because it is clear that when individuals have the option of migration in the future, like in the rest of the brain gain literature, this improves their incentives for education. It is therefore not wise to lock refugees/migrants into positions where there is little scope for improvement, because in the long run, this strongly reduces their incentives for education, which exacerbates the long-run negative impact of conflict.

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